

Please add the following new claim 24:

- A' 1 24. (New) A direct oxidation fuel cell, comprising:
- 2 (A) a membrane electrode assembly disposed within a fuel cell housing,
- 3 including
- 4 (i) a protonically conductive, electronically non-conductive mem-
- 5 brane electrolyte having an anode face and an opposing cathode face;
- 6 (ii) an anodic metallic diffusion layer disposed generally parallel to
- 7 said anode face of said membrane electrode assembly and having a plurality
- 8 of openings therein to allow an associated fuel substance to pass therethrough
- 9 to said anode face of said membrane electrode assembly to produce said elec-
- 10 tricity generating reactions and to allow electrons and carbon dioxide pro-
- 11 duced in said reactions to travel away from said membrane electrode assem-
- 12 bly;
- 13 (iii) an anode catalyst disposed generally between said anode face
- 14 and said anodic metallic diffusion layer, and a cathode catalyst disposed gen-
- 15 erally between said cathode face of the protonically conductive, electronically
- 16 non-conductive membrane electrolyte, and a cathode side of said housing,
- 17 whereby electricity-generating reactions occur upon introduction of said asso-
- 18 ciated fuel substance including anodic disassociation of said fuel substance
- 19 into carbon dioxide, protons and electrons, and a cathodic combination of
- 20 protons, electrons and oxygen from an associated source of oxygen, producing
- 21 water; and
- 22 (B) a load coupled across an anode and cathode of said fuel cell, providing
- 23 a path for said electrons produced at the anode by said electricity-generating
- 24 reactions, to the cathode.

~~Please add the following new claim 25:-~~

- 1 25. (New) The direct oxidation fuel cell as defined in claim 24 wherein
2 said openings in said anodic metallic diffusion layer comprise a plurality of pores
3 formed in said anodic metallic diffusion layer.

~~Please add the following new claim 26:-~~

- 1 26. (New) The direct oxidation fuel cell as defined in claim 24 wherein said anodic me-
2 tallic diffusion layer comprises a porous metal that has openings therein to allow substances
3 to pass through said openings.

~~Please add the following new claim 27:-~~

- 1 27. (New) The direct oxidation fuel cell as defined in claim 24 wherein said anodic me-
2 tallic diffusion layer is at least partially comprised of at least one of titanium, chromium,
3 stainless steel and other alloys, or combinations thereof.

~~Please add the following new claim 28:-~~

- 1 28. (New) The direct oxidation fuel cell as defined in claim 24 wherein said anodic me-
2 tallic diffusion layer is at least partially comprised of a metallic material that does not sub-
3 stantially react with methanol, or other reactants and by products of the electricity generating
4 reactions.

~~Please add the following new claim 29:-~~

- 1 29. (New) The direct oxidation fuel cell as defined in claim 24 wherein
2 said anodic metallic diffusion layer comprises a composition of loose pieces of metal
3 bonded together that have spaces therebetween allowing substances to pass between the in-
4 terstices formed by said spaces between metal pieces.

~~Please add the following new claim 30:~~

- 1 30. (New) The direct oxidation fuel cell as defined in claim 24 wherein said anodic me-
2 tallic diffusion layer is treated with a substance that renders at least a portion of the anodic
3 metallic diffusion layer at least partially hydrophobic.

~~Please add the following new claim 31:~~

- 1 31. (New) The direct oxidation fuel cell as defined in claim 24 wherein said anodic me-
2 tallic diffusion layer is treated with a substance that renders at least a portion of the anodic
3 metallic diffusion layer at least partially hydrophilic.

~~Please add the following new claim 32:~~

- A¹
cont
1 32. (New) The direct oxidation fuel cell as defined in claim 24 wherein said anodic me-
2 tallic diffusion layer is treated with a substance that renders a first portion of the layer hydro-
3 phobic and a second portion of the layer hydrophilic.

~~Please add the following new claim 33:~~

- 1 33. (New) The direct oxidation fuel cell as defined in claim 25 wherein said pores are of
2 more than one dimension.

~~Please add the following new claim 34:~~

- 1 34. (New) The direct oxidation fuel cell as defined in claim 33 wherein a group of said
2 pores formed in said anodic metallic diffusion layer are of a larger size than a remaining
3 group of said pores, and at least some of the pores of said larger size are treated with a hy-
4 drophilic material.

~~Please add the following new claim 35:~~

- 1 35. (New) The direct oxidation fuel cell as defined in claim 34 wherein at least some of
2 said remaining group of pores are treated with a hydrophobic material.

~~Please add the following new claim 36:~~

- 1 36. (New) The direct oxidation fuel cell as defined in claim 33 wherein at least some of
2 said pores of said layer are treated with Nafion, or a substance that renders treated pores at
3 least partially hydrophilic.

~~Please add the following new claim 37:~~

- A¹
cont
1 37. (New) The direct oxidation fuel cell as defined in claim 33 wherein at least some of
2 said pores of said layer are treated with Teflon, or other hydrophobic agent to render treated
3 pores at least partially hydrophobic.

~~Please add the following new claim 38:~~

- 1 38. (New) The direct oxidation fuel cell as defined in claim 29 wherein said loose pieces
2 of metal are bonded together by particle diffusion bonding techniques.

~~Please add the following new claim 39:~~

- 1 39. (New) The direct oxidation fuel cell as defined in claim 38 wherein said particles are
2 treated by at least one of a hydrophobic substance and a hydrophilic substance.

~~Please add the following new claim 40:~~

- 1 40. (New) The direct oxidation fuel cell as defined in claim 24, wherein a first portion of
2 said layer is treated with a hydrophobic substance, and a second portion of said layer is
3 treated with a hydrophilic substance, to form a pattern in said metallic diffusion layer of areas
4 of relative hydrophobicity and areas of relative hydrophilicity, to provide discrete paths

5 through the metallic diffusion layer through which gaseous and liquid reactants and byprod-
6 ucts can pass.

~~Please add the following new claim 41:~~

1 41. (New) The direct oxidation fuel cell as defined in claim 24, further comprising:
2 a flow field plate disposed generally parallel to said anodic metallic diffusion layer,
3 said flow field plate having channels formed therein to direct the flow of substances within
4 said fuel cell across said anodic metallic diffusion layer.

~~Please add the following new claim 42:~~

1 42. (New) The direct oxidation fuel cell as defined in claim 24 wherein
2 said anodic metallic diffusion layer performs as a flow field plate and current collec-
3 tor to conduct electrons produced in said electricity generating reactions and said load being
4 coupled to said anodic metallic diffusion layer to provide a path for said electrons out of said
5 fuel cell as the electricity is produced by said fuel cell.

~~Please add the following new claim 43:~~

1 43. (New) The direct oxidation fuel cell as defined in claim 42 wherein
2 said anodic metallic diffusion layer performing as said flow field plate and current
3 collector includes channels formed therein to direct the flow of fuel to said anode face of said
4 membrane electrode assembly.

~~Please add the following new claim 44:~~

1 44. (New) The direct oxidation fuel cell as defined in claim 24 further comprising
2 a cathodic metallic diffusion layer disposed generally parallel to said cathode face of
3 said membrane electrode assembly and having a plurality of openings therein to allow oxy-
4 gen to pass therethrough to said cathode face of said membrane electrode assembly, and wa-
5 ter to travel away from said membrane electrode assembly.

~~Please add the following new claim 45:~~

- 1 45. (New) The direct oxidation fuel cell as defined in claim 44 wherein
2 said openings in said cathodic metallic diffusion layer comprise a plurality of pores
3 formed in said cathodic metallic diffusion layer.

~~Please add the following new claim 46:~~

- 1 46. (New) The direct oxidation fuel cell as defined in claim 44 wherein
2 said cathodic metallic diffusion layer comprises a porous metal that has openings
3 therein that allow substances to pass through said openings.

~~Please add the following new claim 47:~~

- A' cont
1 47. (New) The direct oxidation fuel cell as defined in claim 44 wherein
2 said cathodic metallic diffusion layer comprises a porous metal that has openings
3 therein that allow removal of liquids from, and allow introduction of gases to the membrane
4 electrode assembly.

~~Please add the following new claim 48:~~

- 1 48. (New) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic
2 metallic diffusion layer is at least in part comprised of a material selected from the group
3 consisting of nickel, copper, titanium, chromium, steel, stainless steel, and other suitable al-
4 loys and combinations thereof.

~~Please add the following new claim 49:~~

- 1 49. (New) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic
2 metallic diffusion layer is at least in part comprised of a material that does not substantially
3 react with byproducts or substances, present on the cathode of the fuel cell.

~~Please add the following new claim 50:~~

- 1 50. (New) The direct oxidation fuel cell as defined in claim 44 wherein
2 said cathodic metallic diffusion layer comprises a composition of loose pieces of
3 metal bonded together that have spaces therebetween allowing substances to pass through the
4 interstices formed by said spaces between said metal pieces.

~~Please add the following new claim 51:~~

- 1 51. (New) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic
2 metallic diffusion layer is treated with a substance that renders the layer at least partially hy-
3 drophobic, to allow the introduction of gases to the membrane electrode assembly.

~~Please add the following new claim 52:~~

- 1 52. (New) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic
2 metallic diffusion layer is treated with a substance that renders the layer at least partially hy-
3 drophilic, to allow the removal of liquids from the cathode face of the membrane electrode
4 assembly.

~~Please add the following new claim 53:~~

- 1 53. (New) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic
2 metallic diffusion layer is treated with a first substance that renders a first portion of the ca-
3 thodic metallic diffusion layer hydrophobic and a second substance that renders a second
4 portion of the cathodic metallic diffusion layer hydrophilic.

~~Please add the following new claim 54:~~

- 1 54. (New) The direct oxidation fuel cell as defined in claim 44 further comprising a sec-
2 ond flow field plate that is disposed generally parallel to said cathodic metallic diffusion
3 layer.

~~Please add the following new claim 55:~~

- 1 55. (New) The direct oxidation fuel cell as defined in claim 44 wherein
2 said cathodic metallic diffusion layer performs as a flow field plate and current col-
3 lector, and said load being coupled to said cathodic metallic diffusion layer to provide a path
4 for electrons to travel to the cathode where it combines with oxygen at said cathode side of
5 said fuel cell, producing water.

~~Please add the following new claim 56:~~

- 1 56. (New) The direct oxidation fuel cell as defined in claim 55 wherein
2 said cathodic metallic diffusion layer performing as said flow field plate and current
3 collector has channels formed therein to direct the flow of oxygen across the cathode face of
4 said membrane electrode assembly.

~~Please add the following new claim 57:~~

- 1 57. (New) The direct oxidation fuel cell as defined in claim 24 wherein said anodic me-
2 tallic diffusion layer is at least in part comprised of a material having properties that improve
3 conductivity.

~~Please add the following new claim 58:~~

- 1 58. (New) The direct oxidation fuel cell as defined in claim 24 wherein said anodic me-
2 tallic diffusion layer is treated or coated with a material to provide improved conductivity.

~~Please add the following new claim 59:~~

- 1 59. (New) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic
2 metallic diffusion layer is at least in part comprised of a material having properties that im-
3 prove conductivity.

~~Please add the following new claim 60:~~

- 1 60. (New) The direct oxidation fuel cell as defined in claim 24 wherein said cathodic
2 metallic diffusion layer is treated or coated with a material to provide improved conductivity.

~~Please add the following new claim 61:~~

- 1 61. (New) The direct oxidation fuel cell as defined in claim 24 wherein
2 said fuel substance is a liquid carbonaceous fuel substance.

~~Please add the following new claim 62:~~

- 1 62. (New) The direct oxidation fuel cell as defined in claim 24 wherein
2 said fuel substance is selected from the group consisting of methanol, ethanol, pro-
3 panol, butanol and aqueous solutions thereof and combinations thereof.

~~Please add the following new claim 63:~~

- 1 63. A direct oxidation fuel cell system, comprising:
2 (A) a direct oxidation fuel cell including an anode, a cathode, and a membrane
3 electrode assembly including a catalyzed membrane disposed between the an-
4 ode and the cathode;
5 (B) a catalyst in proximity to said membrane electrolyte;
6 (C) a source of fuel in communication with the anode;
7 (D) a source of oxygen in communication with said cathode so as to produce
8 electricity-generating reactions including anodic disassociation of said fuel to
9 produce carbon dioxide, protons and electrons and a cathodic combination of
10 protons, electrons and oxygen producing water;
11 (E) an anodic metallic diffusion layer disposed generally parallel to said anode of
12 said membrane electrode assembly and having a plurality of openings therein
13 to allow a fuel substance to pass therethrough to said anode of said membrane
14 electrode assembly to produce said electricity generating reactions, and to al-

- 15 low electrons and carbon dioxide produced in said reactions to travel away
16 from said membrane electrode assembly; and
17 (F) a load coupled across said anode and cathode of said fuel cell, providing a
18 path for said electrons produced at the anode by said electricity-generating re-
19 actions, to the cathode.

~~Please add the following new claim 64:~~

- 1 64. (New) The direct oxidation fuel cell system as defined in claim 63, further compris-
2 ing a liquid/gas separator coupled to separate gaseous products of the anodic reaction from
3 any liquids present.

~~Please add the following new claim 65:~~

- 1 65. (New) The direct oxidation fuel cell system as defined in claim 63, wherein said
2 openings in said anodic metallic diffusion layer comprise a plurality of pores formed in said
3 anodic metallic diffusion layer.

~~Please add the following new claim 66:~~

- 1 66. (New) The direct oxidation fuel cell system as defined in claim 63 wherein
2 said anodic metallic diffusion layer comprises a porous metal that has openings
3 therein that allows substances to pass through said openings.

~~Please add the following new claim 67:~~

- 1 67. (New) The direct oxidation fuel cell system as defined in claim 63 wherein
2 said anodic metallic diffusion layer comprises a composition of loose pieces of metal
3 bonded together that have spaces therebetween allowing substances to pass through the inter-
4 stices formed by the spaces between said metal pieces.

~~Please add the following new claim 68:~~

- 1 68. (New) The direct oxidation fuel cell system as defined in claim 63 further comprising:
2
3 (A) a flow field plate disposed generally parallel to said anodic metallic diffusion
4 layer;
5 (B) a second flow field plate disposed generally parallel to said cathode
6 face of said membrane electrode assembly, and each of said first and second flow
7 field plates having channels formed therein to direct the flow of substances within
8 said fuel cell across its respective metallic diffusion layers; and
9 (C) a load coupled between said first flow field plate and said second flow field
10 plate to form an electrical circuit through which electrical current generated
11 by the fuel cell system may flow.

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~~Please add the following new claim 69:~~

- 1 69. (New) The direct oxidation fuel cell system as defined in claim 63 wherein said anodic metallic diffusion layer performs as a flow field plate and current collector to conduct
2 electrons produced in said electricity generating reactions and said load being coupled to
3 said anodic metallic diffusion layer to provide a path for said electrons away from said anode.
4
5

~~Please add the following new claim 70:~~

- 1 70. (New) The direct oxidation fuel cell system as defined in claim 69 wherein
2 said anodic metallic diffusion layer performing as said flow field plate and current
3 collector includes channels formed therein to direct the flow of fuel to said anode face of said
4 membrane electrode assembly.

~~Please add the following new claim 71:~~

1 71. (New) A direct oxidation fuel cell, comprising:

2 (A) a membrane electrode assembly disposed within a fuel cell housing, includ-
3 ing:

4 (i) a protonically conductive, electronically non-conductive mem-
5 brane electrolyte having an anode face and an opposing cathode face;

6 (ii) a cathodic metallic diffusion layer disposed generally parallel
7 to said cathode face of said membrane electrode assembly and having a plu-
8 rality of openings therein to allow oxygen to pass therethrough to said cathode
9 face of said membrane electrode assembly and protons, electrons and water to
10 travel away from said membrane electrode assembly;

11 (iii) an anode catalyst disposed generally between said anode face
12 and an anode side of said housing, and a cathode catalyst disposed generally between
13 said cathode face and said cathodic metallic diffusion layer, whereby electricity-
14 generating reactions occur upon introduction of said associated fuel substance in-
15 cluding anodic disassociation of said fuel substance into carbon dioxide, protons and
16 electrons, and a cathodic combination of protons, electrons and oxygen from an asso-
17 ciated source of oxygen, producing water; and

18 (B) a load coupled across the anode and cathode of said fuel cell, providing a path
19 for said electrons produced at the anode by said electricity-generating reac-
20 tions, to the cathode.

~~Please add the following new claim 72:~~

1 72. (New) The direct oxidation fuel cell as defined in claim 71, wherein
2 said openings in said cathodic diffusion layer comprise a plurality of pores formed in
3 said cathodic metallic diffusion layer.

~~Please add the following new claim 73:~~

1 73. (New) The direct oxidation fuel cell as defined in claim 71, wherein

2 said cathodic metallic diffusion layer comprises a porous metal that has openings
3 therein that allows substances to pass through said openings.

~~Please add the following new claim 74:~~

1 74. (New) The direct oxidation fuel cell as defined in claim 71, wherein
2 said cathodic metallic diffusion layer is at least in part comprised of a material se-
3 lected from the group consisting of nickel, copper, titanium, chromium steel, stainless steel,
4 and other suitable alloys and combinations thereof.

~~Please add the following new claim 75:~~

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cont
1 75. (New) The direct oxidation fuel cell as defined in claim 71, wherein
2 said cathodic metallic diffusion layer is at least in part comprised of a material that
3 does not substantially react with byproducts or substances, present on the cathode of the fuel
4 cell.

~~Please add the following new claim 76:~~

5 76. (New) The direct oxidation fuel cell as defined in claim 71, wherein
6 said cathodic metallic diffusion layer comprises a composition of loose pieces of
7 metal bonded together that have spaces therebetween allowing substances to pass through the
8 interstices formed by the spaces between said metal pieces.

~~Please add the following new claim 77:~~

1 77. (New) The direct oxidation fuel cell as defined in claim 71 wherein said cathodic
2 metallic diffusion layer is treated with a substance that renders the layer at least partially hy-
3 drophobic.

~~Please add the following new claim 78:~~

- 1 78. (New) The direct oxidation fuel cell as defined in claim 71 wherein said cathodic
2 metallic diffusion layer is treated with a substance that renders the layer at least partially hy-
3 drophilic.

~~Please add the following new claim 79:~~

- 1 79. (New) The direct oxidation fuel cell as defined in claim 71 wherein said cathodic
2 metallic diffusion layer is treated with a substance that renders a first portion of the layer hy-
3 drophobic and a second portion of the layer hydrophilic.

~~Please add the following new claim 80:~~

- 1 80. (New) The direct oxidation fuel cell as defined in claim 72 wherein said pores are of
2 more than one dimension.

~~Please add the following new claim 81:~~

- 1 81. (New) The direct oxidation fuel cell as defined in claim 72 wherein a group of said
2 pores formed in said cathodic metallic diffusion layer are of a larger size than a remaining
3 group of said pores, and at least some of the pores of said larger size are treated with a hy-
4 drophilic material.

~~Please add the following new claim 82:~~

- 1 82. (New) The direct oxidation fuel cell as defined in claim 81 wherein at least some of
2 said remaining group of pores are treated with a hydrophobic material.

~~Please add the following new claim 83:~~

- 1 83. (New) The direct oxidation fuel cell as defined in claim 72 wherein at least some of
2 said pores of said layer are treated with Nafion, or a substance that renders treated pores at
3 least partially hydrophilic.

~~Please add the following new claim 84:~~

- 1 84. (New) The direct oxidation fuel cell as defined in claim 72 wherein at least some of
2 said pores of said layer are treated with Teflon, or other hydrophobic agent to render treated
3 pores at least partially hydrophobic.

~~Please add the following new claim 85:~~

- 1 85. (New) The direct oxidation fuel cell as defined in claim 71 wherein said loose pieces
2 of metal are bonded together by particle diffusion bonding techniques.

~~Please add the following new claim 86:~~

- 1 86. (New) The direct oxidation fuel cell as defined in claim 71 wherein said particles are
2 treated by at least one of a hydrophobic substance and a hydrophilic substance.

Please add the following new claim 87:

~~Please add the following new claim 87:~~

- 1 87. (New) The direct oxidation fuel cell as defined in claim 71, wherein a first portion of
2 said layer is treated with a hydrophobic substance, and a second portion of said layer is
3 treated with a hydrophilic substance, to form a pattern in said diffusion layer of areas of rela-
4 tive hydrophobicity and areas of relative hydrophilicity, to provide discrete paths through the
5 metallic diffusion layer through which gaseous and liquid reactants and byproducts can pass.

~~Please add the following new claim 88:~~

- 1 88. (New) The direct oxidation fuel cell as defined in claim 71, further comprising:
2 a flow field plate disposed generally parallel to said cathodic metallic diffu-
3 sion layer, said flow field plates having channels formed therein to direct the flow of sub-
4 stances within said fuel cell across the cathodic metallic diffusion layer.

~~Please add the following new claim 89:~~

- 1 89. (New) The direct oxidation fuel cell as defined in claim 71, wherein
2 said cathodic metallic diffusion layer performs as a flow field plate and current col-
3 lector to reunite said electrons with protons that pass through said membrane and said load
4 being coupled to said cathodic metallic diffusion layer to reunite said electrons with said
5 protons and react with oxygen at said cathode side of said fuel cell thus producing water.

~~Please add the following new claim 90:~~

- 1 90. (New) The direct oxidation fuel cell as defined in claim 89, wherein
2 said cathodic metallic diffusion layer performing as said flow field plate and current
3 collector has channels formed therein to direct the flow of said oxygen across the cathode
4 face of said membrane electrode assembly.

~~Please add the following new claim 91:~~

- 1 91. (New) The direct oxidation fuel cell as defined in claim 71, wherein
2 said fuel substance is a liquid carbonaceous fuel substance.

~~Please add the following new claim 92:~~

- 1 92. (New) The direct oxidation fuel cell as defined in claim 71, wherein
2 said fuel substance is selected from the group consisting of methanol, ethanol, pro-
3 panol, butanol and aqueous solutions thereof and combinations thereof.

~~Please add the following new claim 93:~~

- 1 93. (New) A direct oxidation fuel cell system, comprising:
- 2 (A) a direct oxidation fuel cell including an anode, a cathode, and a membrane
- 3 electrode assembly disposed between the anode and the cathode;
- 4 (B) a catalyst in proximity to said membrane electrolyte;
- 5 (C) a source of fuel in communication with the anode;
- 6 (D) a source of oxygen in communication with said cathode so as to produce
- 7 electricity-generating reactions including anodic disassociation of said fuel to
- 8 produce carbon dioxide, protons and electrons and a cathodic combination of
- 9 protons, electrons and oxygen producing water;
- 10 (E) a cathodic metallic diffusion layer disposed generally parallel to said cathode
- 11 face of said membrane electrode assembly and having a plurality of openings
- 12 therein to allow oxygen to pass therethrough to said cathode face of said
- 13 membrane electrode assembly and protons, electrons and water to travel away
- 14 from said membrane electrode assembly; and
- 15 (F) a load coupled across the anode and the cathode of said fuel cell, providing a
- 16 path for said electrons produced at the anode by said electricity-generating re-
- 17 actions, to the cathode.

~~Please add the following new claim 94:~~

- 1 94. (New) The direct oxidation fuel cell system as defined in claim 93, further compris-
- 2 ing:
- 3 a liquid/gas separator coupled to separate gaseous products of the anodic reaction
- 4 from any liquids present.

~~Please add the following new claim 95:~~

- 1 95. (New) The direct oxidation fuel cell system as defined in claim 93, wherein

2 said openings in said cathodic metallic diffusion layer comprise a plurality of pores
3 formed in said cathode metallic diffusion layer.

~~Please add the following new claim 96:~~

1 96. (New) The direct oxidation fuel cell system as defined in claim 93, wherein said
2 cathode metallic diffusion layer comprises a porous metal that has openings therein that al-
3 low substances to pass through said opening.

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cont
~~Please add the following new claim 97:~~

1 97. (New) The direct oxidation fuel cell system as defined in claim 93, wherein
2 said cathode metallic diffusion layer comprises a composition of loose pieces of metal
3 bonded together that have spaces therebetween allowing substances to pass through the inter-
4 stices formed by said spaces between said metal pieces.

~~Please add the following new claim 98:~~

1 98. (New) The direct oxidation fuel cell system as defined in claim 93, further compris-
2 ing:
3 (A) a first flow field plate disposed generally parallel to said anode face of said
4 membrane electrode assembly;
5 (B) a second flow field plate disposed generally parallel to said cathode metallic
6 diffusion layer, each of said flow field plates having channels formed therein
7 to direct the flow of substances within said fuel cell; and
8 (C) a load coupled between said first flow field plate and said second flow field
9 plate to form an electrical circuit external to said fuel to extract electrons, and
10 thus electricity from said fuel cell.

~~Please add the following new claim 99:~~

1 99. (New) The direct oxidation fuel cell system as defined in claim 93, wherein said
2 cathode metallic diffusion layer performs as a flow field plate and current collector to reunite

3 electrons with protons that pass through said membrane and said load being coupled to said
4 cathode metallic diffusion layer to reunite said electrons with said protons and react with
5 oxygen.

Please add the following new claim 100:

1 100. (New) The direct oxidation fuel cell system as defined in claim 99, wherein said ca-
2 thodic metallic diffusion layer performing as said flow field plate and current collector has
3 channels formed therein to direct the flow of oxygen across the cathode face of said mem-
4 brane electrode assembly.

~~Please add the following new claim 101:~~

1 101. (New) The direct oxidation fuel cell system as defined in claim 93, wherein
2 said fuel is a liquid carbonaceous fuel.

~~Please add the following new claim 102:~~

1 102. (New) The direct oxidation fuel cell system as defined in claim 93, wherein
2 said fuel is selected from the group consisting of methanol, ethanol, propanol, butanol
3 and aqueous solutions thereof, and combinations thereof.

~~Please add the following new claim 103:~~

1 103. (New) The direct oxidation fuel cell system as defined in claim 93 wherein said ca-
2 thodic metallic diffusion layer has openings therein that allow removal of liquids from, and
3 allow the introduction of gases to the membrane electrode assembly.

~~Please add the following new claim 104:~~

1 104. (New) A direct oxidation fuel cell system comprising:
2 (A) a direct oxidation fuel cell means including a membrane electrode assembly
3 having an anode, a cathode and a protonically conductive, electronically non-

4 conductive membrane electrolyte disposed between the anode and the cath-
5 ode;

6 (B) means for providing a fuel substance to said fuel cell;

7 (C) means for providing oxygen to said cathode of said membrane electrode as-
8 sembly so as to produce electricity-generating reactions including cathodic
9 combination of protons, electrons and oxygen producing water; and

10 (D) means for distributing said fuel substance generally evenly to said anode of
11 said membrane electrode assembly so as to produce electricity-generating re-
12 actions including anodic disassociation of said fuel substance to produce car-
13 bon dioxide, protons and electrons.

1 ~~Please add the following new claim 105:~~

A *cons* 1 105. (New) The direct oxidation fuel cell system as defined in claim 104, further com-
2 prising a means for distributing said oxygen generally evenly to said cathode and said means
3 for distributing said oxygen.

~~Please add the following new claim 106:~~

1 106. (New) The direct oxidation fuel cell system as defined in claim 104, further com-
2 prising said means for distributing said fuel substance being of a substantially metallic com-
3 position.

~~Please add the following new claim 107:~~

1 107. (New) The direct oxidation fuel cell system as defined in claim 104, further com-
2 prising a means for allowing gaseous products of the anodic reaction to be removed from the
3 membrane electrode assembly.

~~Please add the following new claim 108:~~

- 1 108. (New) The direct oxidation fuel cell system as defined in claim 104, further com-
2 prising a means for allowing fluid byproducts of the cathodic reaction to be removed from
3 the membrane electrode assembly.

~~Please add the following new claim 109:~~


- 1 109. (New) The direct oxidation fuel cell system as defined in claim 104, wherein said
2 means for distributing said oxygen being substantially comprised of a metallic composition.

~~Please add the following new claim 110:~~

- A_{CONT} 1 110. (New) A means for generating electricity comprising:
2 ✓(A) a direct oxidation fuel cell means including a membrane electrode assembly
3 having an anode, a cathode, and a protonically conductive electronically non-
4 conductive membrane electrolyte disposed between said anode and said cath-
5 ode;
6 ✓(B) means for providing oxygen coupled to said cathode so as to produce electric-
7 ity-generating reactions including anodic disassociation of a fuel substance to
8 produce carbon dioxide, protons and electrons and a cathodic combination of
9 protons, electrons and oxygen producing water;
10 ✓(C) means for providing said fuel substance to said fuel cell
11 (D) means for distributing oxygen generally evenly to said cathode; and
12 (E) means for coupling the anode to the cathode.
- END

Please charge any additional fee occasioned by this paper to our Deposit Account No.
03-1237.

Respectfully submitted,


Rita M. Rooney
Reg. No. 30,585
CESARI AND MCKENNA, LLP
88 Black Falcon Avenue
Boston, MA 02210-2414
(617) 951-2500